

1-2 Principles of Grazing Management

Pasture-based dairy farming is a balance between managing the pasture and the cows to maximise sustainable profit. Grazing management must optimise future pasture production and quality, with milksolids production and reproductive performance.

The tools of grazing management are frequency and intensity of grazing. Pasture production and quality are mainly affected by cover (amount of pasture) and grazing intensity. Pasture intake is mainly affected by the amount and quality of the available pasture offered each day.

Pasture and herd performance are optimised by having sufficient quality feed on an annual basis to meet cow demand and by allocating this feed applying the following principles and management practises:

- Control the area grazed each day (or rotation length) to manipulate pasture eaten to meet average pasture cover targets for the farm
- **Estimate the area and pre-grazing cover required for the cows based on the target grazing residual and adjust after observing when / if the cows achieve a “consistent, even, grazing height”.**
- Make management decisions to maximise per cow production for the season not at any one grazing, the “main course principle – no dessert”
- Treat pasture as a crop - remove pasture grown since last grazing and prevent post-grazing height increasing over the season
- Have pasture cover distributed between paddocks in a feed wedge to ensure that high quality pasture is offered on all paddocks
- Keep average pasture cover above 1800 kg DM/ha^{1/} in early spring and between 2000-2400 kg DM/ha^{1/} for the season to maximise pasture growth rates
- Over the season the height of post-grazing residuals (cover) does not change but the dry matter mass does increase (Figure 1). This is the value of using “clicks” on the Rising Plate Meter (RPM) or one formula for the RPM for the season

Note^{1/} Kg DM/ha based on the winter RPM formula “clicks” x 140 + 500

Optimising Pasture Eaten and Per Cow Production – “Main Course Principle”

Grazing experiments have consistently demonstrated that offering too much pasture is as bad as offering too little and “fully feeding” a cow on pasture comes at a cost. Under rotational grazing, daily intake is governed primarily by the amount and quality of pasture offered. However, high pasture allowance results in high post-grazing residuals, especially if combined with high pre-grazing covers. Leaving high residuals results in poor pasture utilisation and a loss of feed quality in subsequent grazings.

Therefore maximising cow intake at any one grazing will reduce the cow’s intake at future grazings as pasture quality and quantity are reduced. By allocating high quality pasture and removing what pasture has grown since the last grazing (leaving a consistent, even grazing height) cow intake can be optimised for the season.

What is High Quality Pasture?

High quality pasture is green and leafy with minimal seed head and dead matter. Dead matter is the main driver of loss in pasture quality. High quality pasture can be visually described as having:

- Less than 20% dead material in the base of the sward
- Less than 10% seed head and
- Greater than 60-70% of green leafy material, with the highest quality pasture being more than 80% green leaf

Pasture quality also decreases with increasing ambient temperatures causing more lignification (thickening of the cell walls). Hence in the northern regions even with the best pasture management there will be some loss in pasture quality over the summer. *Refer to FarmFact 1-34 Summer Nutrition for more information.*

Pasture quality can be confirmed by laboratory analysis for:

- metabolisable energy (ME); target 12.0 ME plus
- crude protein (CP); targets for pasture fed cows; early spring 18-24%; mid lactation 16%; late lactation 14%; dry cow 12%
- neutral detergent fibre (NDF); target greater than 35%, less than 45%

Why is Pasture Quality Important?

Pasture quality has a major impact on milksolids production as it not only determines how much energy there is per kg DM eaten but it also drives cow intake as shown in Table 1. Grazing trials in New Zealand have shown that a 10% increase in pasture digestibility results in an increase in per cow production of 0.3 to 0.45 kg MS/cow/day.

Table 1 The influence of pasture quality on maximum intake and MS production (500kg Friesian with no change in liveweight)

Pasture Quality	Effect on intake and milksolids	
	kg DM/day	MS (kg/day)
MJME / kgDM		
12.0 (equiv to 80% digestibility of DM)	18.0	2.3
11.0 (equiv to 73% digestibility of DM)	17 - 17.3	1.9
10.0 (equiv to 66% digestibility of DM)	16 - 16.6	1.5 - 1.6

High quality pasture is the result of good grazing management - offering the right pre-grazing cover to achieve a “consistent, even grazing height”

- Grazing management **does not** affect the quality of the emerging leaf; new young leaf is always high quality.
- Grazing management **does** affect the quality of the feed offered as it is a mix of new growth and what was not eaten at the previous grazing. Grazing intensity and rotation length affect pasture quality as they affect the age of the leaf.

What is a consistent, even grazing height?

- For a ryegrass/clover pasture (no weeds and not pugged) a consistent, even grazing height (few or no clumps) will be 7-8 clicks on the RPM
- 7-8 clicks on the standard, winter formula ($\text{RPM clicks} \times 140 + 500$) is 1500 - 1600 kg DM per ha
- 7-8 clicks on the RPM is equivalent to 3.5 to 4 cm compressed height
- The plate meter will over estimate residuals where there are weeds or there is pugging damage.
- Grazing residuals are higher for pasture species which have a higher crown e.g. tall fescue, cocksfoot.

Refer to FarmFact 1-15 Using the Rising Plate Meter for more information.

Use one equation for simplicity and convenience

The equation of $\text{RPM clicks} \times 140 + 500$ is the best fit for most situations and makes the data produced the easiest to understand.

In the past, target grazing residuals have been communicated to farmers in kgs DM/ha with different targets throughout the year. However this lead to confusion as although the absolute amount of dry matter increased (more dry matter accumulating in the base of the sward but unavailable to grazing cows) from spring to summer the actual grazing height did not change as shown in Figure 1.

Therefore height or using one equation all year are the preferred methods to express post-grazing cover targets as they eliminate the confusion created from having different targets for different months of the year and changing the plate meter equations.

Figure 1 The relationship between post-grazing residual cover and pasture height at Ruakura

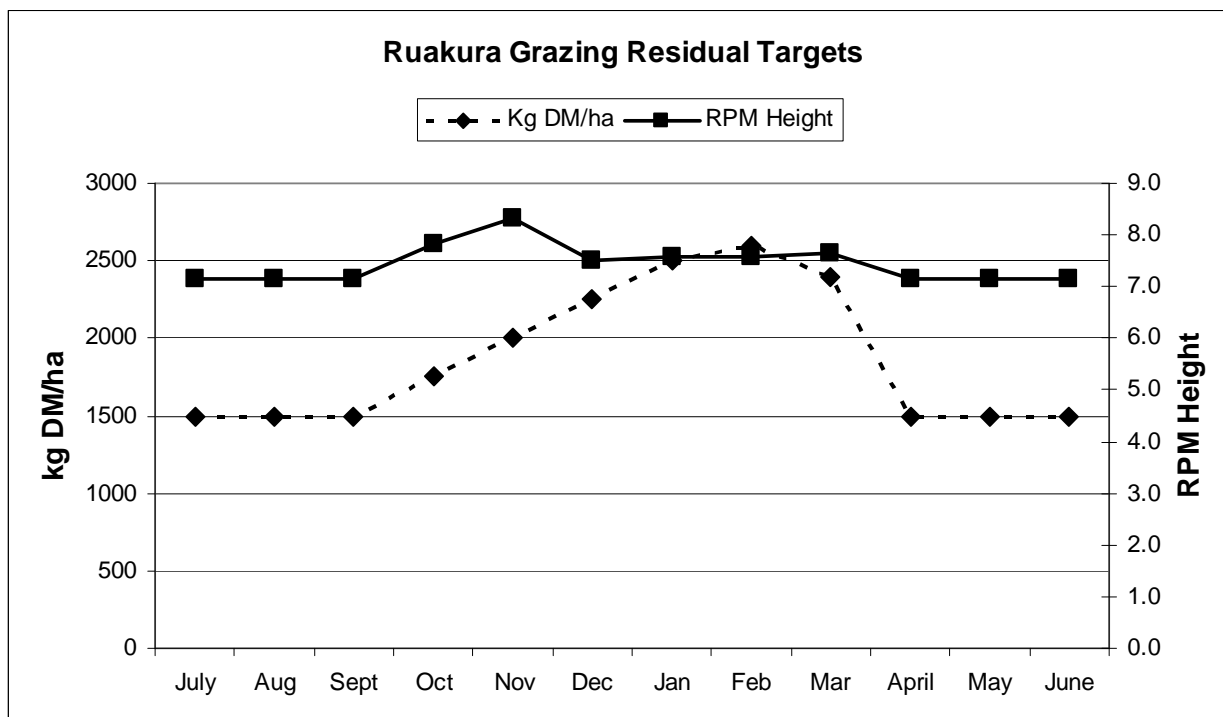
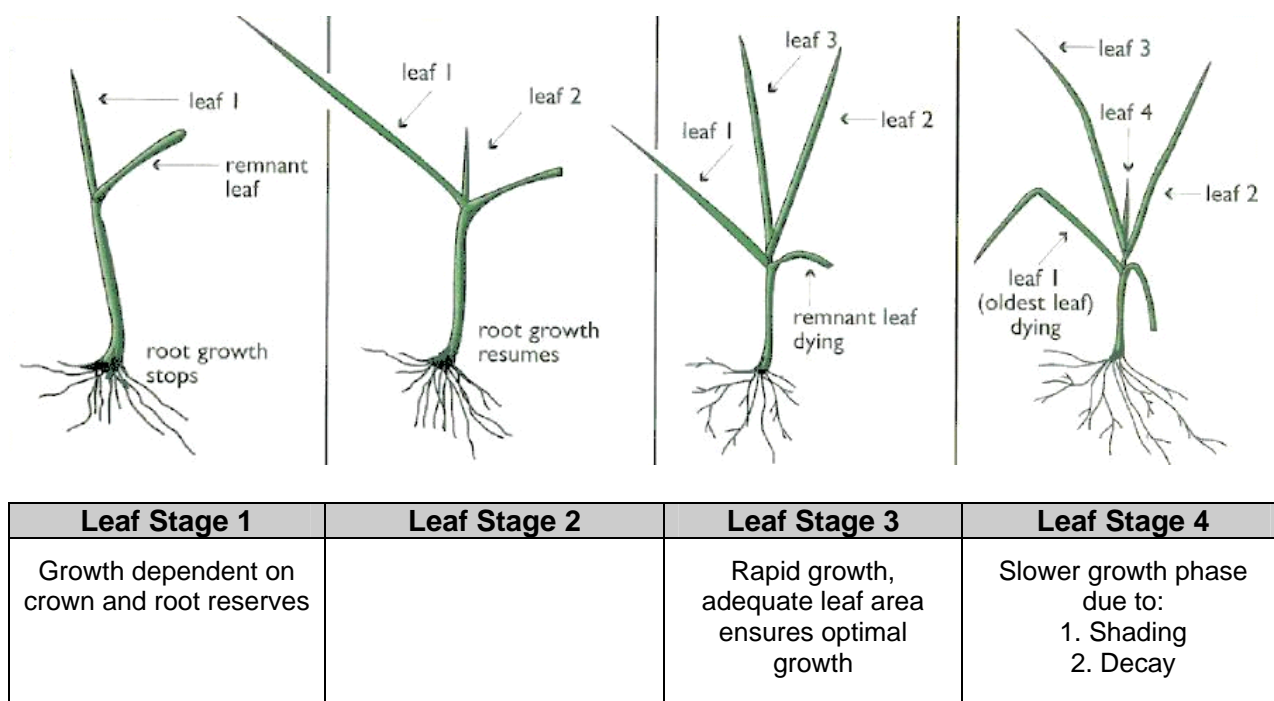


Figure 2 How a ryegrass tiller grows



The “3 Leaf Principle”

Figure 2 illustrates that after the emergence of the 4th leaf the 1st leaf starts to die, slowing pasture growth rates and reducing feed quality. Grazing before the emergence of the 2nd leaf will reduce yield, and if repeated will impact on plant survival.

The 3 leaf principle is a useful guide to check on grazing management decisions, however it is not predictive. There are times of the season when matching feed supply to demand requires grazing pastures earlier or later than the 3 leaf principle to meet average pasture cover targets. For example in the autumn when the rotation is slowed down to increase feed cover for winter and in the spring when the rotation is sped up in anticipation of growth.

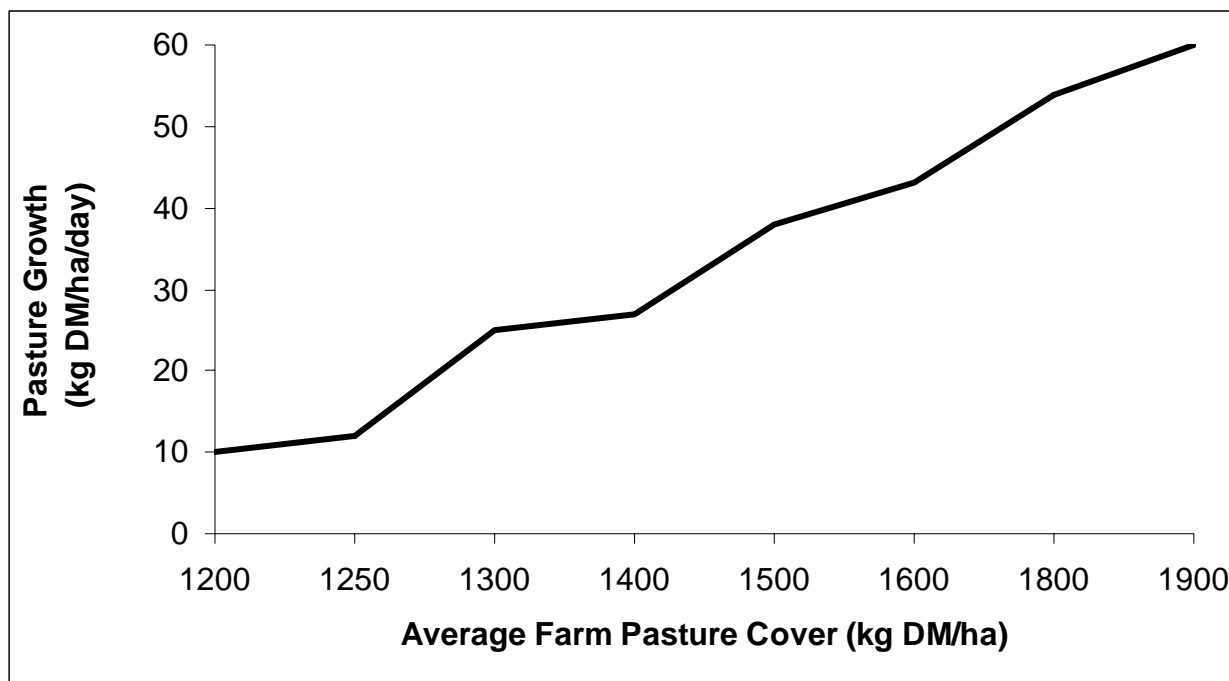
How Does Grazing Management Affect Pasture Growth?

Grazing intensity can affect the plants reserves for regrowth and the leaf area to trap light if average pasture cover drops too low or if pastures are left clumpy. Grazing to a height of 7-8 clicks on the RPM (ryegrass/clover pastures) does not affect pasture growth and encourages growth of new tillers.

Where pastures are left clumpy growth rates can be reduced due to:

- older, less photosynthetically efficient plant material
- stems, leaves and tillers die and lose dry matter
- increased shading of tillers and tiller death in the longer clumps
- shading slows tiller initiation, photosynthesis and clover growth

As Figure 3 shows where average pasture cover (APC) is less than 1800 kg DM/ha in the spring, pasture growth rates are reduced, and for most of the season APC needs to be 2000 – 2400 kg DM/ha to maximise growth.

Figure 3 Average farm cover in spring and the effect on pasture growth**Grazing frequency will reduce pasture grown if:**

- Grazing before the emergence of the 3rd leaf as the leaf area to trap light is not optimised and the plants reserves are depleted
- The grazing interval is too long and results in canopy closure (when light can not penetrate through the canopy) and shading of leaves (as detailed above)

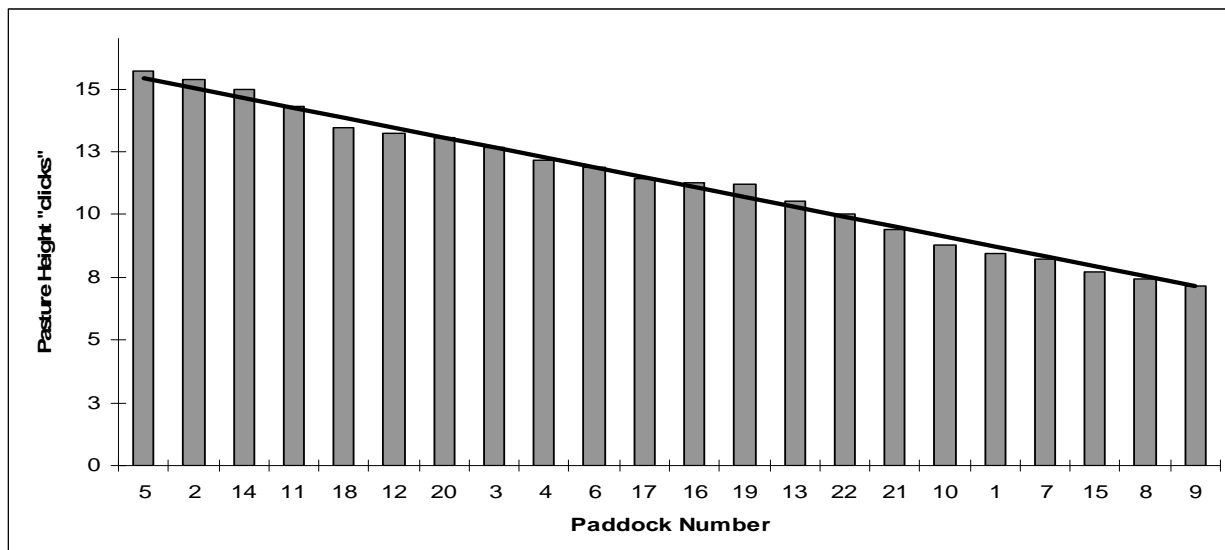
Feed Wedge

Feed cover needs to be distributed over the farm in a wedge when the paddocks are ranked from longest to shortest (*Figure 4*). Only one paddock should be at the target grazing height (cover) at any one time with the rest of the farm growing high quality feed. This is easier to manage when paddocks are of similar size. Ideally the feed cover on the farm should line up with the target line as shown in *Figure 4*. The target line can be drawn either by plotting:

- The two ends of the graph (the longest cover and the target residual), pre-grazing cover (height) to the target post-grazing cover (height) or
- The midway point, which is the target average pasture cover (height) to the target to post-grazing cover (height)

Refer FarmFact 1-14 pasture feed wedges for more information.

Figure 4 Feed wedge with target line



How to Calculate Target Pre-grazing Cover

(Stocking rate x Intake x Rotation) + Optimum residual = Pre-grazing Cover
 (___ cows/ha x ___ kgDM/cow x ___ days) + ___ kg DM/ha = ___ kgDM/ha
 E.g. (3.0 cows/ha x 17.5 kg DM/cow x 22 days) + 1500 kg DM/ha = 2650 kg DM/ha

How to Convert to kg DM/ha to RPM Clicks

(Grazing cover – adder) divided by the Multiplier = Clicks
 e.g winter formula adder = 500; multiplier = 140
 Pre-grazing cover height in clicks = (2650-500)/140 = 15.4 clicks
 Post-grazing cover height in clicks = (1500-500)/140 = 7 clicks

Target pre-grazing and post-grazing height (covers)

Tables 2, 3 and 4 detail the target pre-grazing and post-grazing height (covers) for lactating and dry cows, grazing ryegrass dominant pastures and the impact on pasture intake, pasture quality and re-growth where targets are not achieved.

Grazing covers are expressed as “clicks” on the Rising Plate Meter (RPM) or in kg DM/ha based on the winter formula (clicks x 140 + 500) and are for ryegrass dominant pastures.

Table 2 Target post-grazing cover and height for dry cows

Height Kg DM/ha RPM clicks	Too low < 1000 Less than 3.5	Optimum 1100-1300 4.5 – 6.0	Too High >1500 > 7.0
DM Intake	Cows fed less than maintenance	Maintenance graze to 1100 kg DM/ha (4.5 clicks) Liveweight gain graze to 1300-1500 kg DM/ha (6-7 clicks)	Poor utilisation of pasture, clumps. Cow intake will be compromised later; e.g. in early lactation if milking cows have to graze clumps

Table 3 Target pre-grazing covers and height for lactating cows

Height Kg DM/ha RPM Clicks	Too Low <2400 14 or less	Optimum 2600-3200 15-19	Too High >3400 > 21
DM Intake	Restricted	High	Restricted by high fibre % and low ME/kgDM
MJME/kg DM	>12.0 ME	>12.0 ME	<11.0 ME
Regrowth	Reduced	Optimum	Delayed

Table 4 Target post-grazing covers and height for lactating cows

Height Kg DM/ha RPM	Too Low <1500 Less than 7	Optimum 1500-1600 7 - 8	Too High >1700 > 8.5
DM Intake	Restricted <3.3% of lwt	Optimum 3.3-3.8% of lwt	High 4.0% of lwt
MJME/kg DM	High >12.0 ME	High >12.0 ME	Lower next round
Regrowth	No difference unless frequently grazed ie grazing interval < 20 days		Restricted as clumps grow less

How to achieve target post-grazing heights/covers (residuals)

The key to achieving the target post-grazing residual is to offer the cows the right amount of feed or be prepared to return the cows to the paddock until the target residual is reached. As all methods of estimating pasture (RPM, eye assessment etc) are only estimates, adjustments to the feed offered need to be made based on the residual at each grazing and the time that the cows achieve the residual.

Cows will be underfed if they achieve the target grazing residual 2-3 hours after being in a paddock. Some farmers use 24 hour grazing, offering a fresh break after the afternoon milking so they only have to observe grazing residuals once a day, in day light.

The grazing residual targets outlined in Table 4 for lactating cows will only result in high performance where the farm has been grazed out evenly (no clumps) in autumn/winter. Ideally this is grazing all pastures with dry cows to 1200 kg DM/ha (5 clicks RPM) and no more than 1500 kg DM/ha (7 clicks RPM) by lactating cows in the autumn/winter, prior to being grazed by milkers in the spring.

Additional Reading:

Pastures and Supplements for Grazing Animals NZSAP Occasional Publication No. 14:
Milk Production from Pasture Holmes, C.W. et al 2002